

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of)
)
MICHAEL HOCK)
)
Filed Herewith)
)
LIGHTWEIGHT DOOR FOR)
MOTOR VEHICLES)

PRELIMINARY AMENDMENT

Box Patent Application
Commissioner for Patents
Washington, D.C. 20231

Sir:

Prior to examination, please amend the above identified application, as shown in clean sheet form below, and in marked-up form on the attachment.

In the Specification:

At the top of page 1, after the title and before the first line of text, insert the following:

CROSS REFERENCE TO RELATED APPLICATION

This application claims priority from German Patent Application No. 100 63 417.6, filed December 19, 2000.

BACKGROUND AND SUMMARY

Paragraph beginning at line 34 of page 3 has been amended as follows:

The lightweight door for motor vehicles, according to the invention, meets the above-mentioned objective with the characteristics set forth herein. It is significant that the preferred embodiment of the invention provides a design which altogether has been realised with the particular characteristics of light metal, in particular of aluminium, in mind. The realised structure uses a type of hidden bar element construction. Closed

chamber profiles are used for load paths of impinging forces and moments. The individual bars of the bar work construction join to form structural frame gussets where they are welded together. This results in a torsionally rigid frame structure. More heavily loaded areas which cannot be optimally supported using the bar-element construction technique, in particular areas around hinges and the lock, are specifically reinforced. By contrast, the large areas of the lightweight door where forces and moments impinge only to a small extent, can be made with thin walls as pressed parts or deep drawn parts made from light metal sheet, in particular from aluminium sheet. This results in considerably reduced weight of the lightweight door, without there being a negative effect on rigidity.

Paragraph beginning at line 19 of page 4 has been amended as follows:

Further preferred embodiments and improvements of the basic teaching of the invention are provided as set forth herein.

Before the paragraph beginning at line 23 of page 4, insert the following:

BRIEF DESCRIPTION OF THE DRAWINGS

Before the paragraph beginning at line 11 of page 5, insert the following:

DETAILED DESCRIPTION

Paragraph beginning at line 11 of page 6 has been amended as follows:

Furthermore, a profile window frame 8 made in one piece from light metal/light metal alloys, in particular from aluminium/aluminium alloys, forms part of the lightweight door according to the invention. At its ends, said profile window frame 8 is permanently connected, in particular welded, in any case to the inner window gutter profile 5. Also part of the lightweight door is an outer skin 9 of the door, said outer skin 9 being made in one piece and being permanently connected to the supporting frame 1 and the outer window gutter profile 6, in the present case in particular by flanging. Preferably, the window frame 8 is an extruded profile, bent by stretching and rolling. Its particular design is

the subject of a parallel patent application, namely commonly owned co-pending U.S. Patent Application Serial No. _____, Attorney Docket 4680-00002, filed on even date herewith, incorporated herein by reference and whose content by reference also forms part of the present disclosure.

Paragraph beginning at line 11 of page 12 has been amended as follows:

Overall, rigidity of the lightweight door is significantly increased in that the window frame 8 is rigidly connected, in a highly effective way, to the supporting frame 1. To this effect, the embodiment shown, which is the preferred embodiment, provides for the ends of the window frame 8 to extend beyond the front and rear end of the inner window gutter profile 5, where they are welded to the window gutter profile 5. As a result, the window frame 8 reaches comparatively far down into the door gutter region. This provides an adequate lever arm to effectively deflect bending moments impinging from the outside, into the door frame 1. At the lock reinforcement 11b, the embodiment shown (Fig. 6) comprises an additional frame shoulder 19 which is welded to the end of the window frame 8 which end is located in this location. Fig. 6 shows that the window frame 8 extends quite deeply into the door gutter region. The position of this section is shown in Fig. 2. In this way, the point of application of the forces is brought close to the lock position.

In the Claims:

Before the first claim insert:

What is claimed is:

Claim 1 has been amended as follows:

1. (amended) A lightweight door for motor vehicles

comprising an essentially U-shaped supporting frame (1) made from light metal or a light metal alloy, wherein said supporting frame (1) comprises: a hinge support (2) forming one U-limb, a lock support (3) forming the other U-limb and a door bottom (4) forming the U-stay, with an inner and an outer window gutter profile (5, 6) which is made from light metal or a light metal alloy, said window gutter profile (5, 6)

supplementing the U-shaped supporting frame (1);

wherein if the lightweight door is installed in a motor vehicle body, the window gutter profiles (5, 6) are essentially aligned in longitudinal direction of the vehicle, with the ends of the window gutter profiles (5, 6) being permanently connected to the hinge support (2) and the lock support (3);

comprising a lateral impact protection element (7) arranged in the supporting frame (1), with the ends of said impact protection element (7) being permanently connected to the supporting frame (1), wherein the lateral impact protection element (7) is an extruded profile made from light metal or a light metal alloy;

comprising a window frame (8) made from light metal or a light metal alloy, wherein the ends of the window frame (8) are permanently connected to the inner window gutter profile (5);

wherein the supporting frame (1) is made in one piece as a pressed part or a deep-drawn part, from a metal sheet of minimum thickness.

Claim 7 has been amended as follows:

7. (amended) The lightweight door according to claim 1, wherein, in more heavily loaded areas, reinforcement and connection sheets (11) are arranged on the supporting frame (1) and permanently connected to said supporting frame (1) by a connection technique selected from the group consisting of press-riveting, bonding, and welding.

Claim 8 has been amended as follows:

8. (amended) The lightweight door according to claim 6, wherein, in the region of structural frame gussets, reinforcement and connection sheets (11) are arranged on the supporting frame (1) and permanently connected to said supporting frame (1) by a connection technique selected from the group consisting of press-riveting, bonding, and welding.

Claim 9 has been amended as follows:

9. (amended) A lightweight door for motor vehicles

comprising an essentially U-shaped supporting frame (1) made from light metal or a light metal alloy,

wherein said supporting frame (1) comprises: a hinge support (2) forming one U-limb, a lock support (3) forming the other U-limb and a door bottom (4) forming the U-stay,

with an inner and an outer window gutter profile (5, 6) made from light metal or a light metal alloy, said window gutter profile (5, 6) supplementing the U-shaped supporting frame (1);

wherein if the lightweight door is installed in a motor vehicle body, the window gutter profiles (5, 6) are essentially aligned in longitudinal direction of the vehicle, and the ends of the window gutter profiles (5, 6) are permanently connected to the hinge support (2) and the lock support (3);

comprising a lateral impact protection element (7) arranged in the supporting frame (1), with the ends of said impact protection element (7) being permanently connected to the supporting frame (1), wherein the lateral impact protection element (7) is an extruded profile made from light metal or a light metal alloy;

comprising a window frame (8) made from light metal or a light metal alloy, wherein the ends of the window frame (8) are permanently connected to the inner window gutter profile (5);

wherein the supporting frame (1) is made in one piece as a pressed part or a deep-drawn part, from a metal sheet of minimum thickness;

wherein the supporting frame (1) contributes to form part of the inside skin (11) of the door; wherein the supporting frame (1) forms an area-shaped cross stay (1") which closes the basic U-shape and which is located opposite the door bottom (4); wherein the connection regions of the various structural members, namely the supporting frame (1), inner window gutter profile (5), lateral impact protection element (7) and window frame (8), spatially coincide so as to form structural frame gussets;

wherein, in more heavily loaded areas, reinforcement and connection sheets (11) are arranged on the supporting frame (1) and permanently connected to said

supporting frame (1) by a connection technique selected from the group consisting of press-riveting, bonding, and welding.

Claim 10 has been amended as follows:

10. (amended) The lightweight door according to claim 7, wherein the reinforcement and connection sheets (11) are selected from the group consisting of pressed parts and deep-drawn parts.

Claim 11 has been amended as follows:

11 (amended) The lightweight door according to claim 7, wherein the reinforcement and connection sheets (11) in part form hollow chambers (12) with the supporting frame (1) at the hinge support (2).

Claim 16 has been amended as follows:

16. (amended) The lightweight door according to claim 15, wherein the lateral impact protection element (7) on a front side door is arranged so as to slope downward from the hinge support (2) to the lock support (3), and the free L-limb of the upper hinge point strengthening plate (15) is L-shaped and directly welded together with the end of the lateral impact protection element (7).

Claim 17 has been amended as follows:

17. (amended) The lightweight door according to claim 15, wherein on a rear side door the lateral impact protection element (7) is arranged so as to be upward sloping from the hinge support (2) to the lock support (3), and wherein the lower hinge point strengthening plate (15) is L-shaped, with its free L-limb being permanently connected to the lateral impact protection element (7).

Claim 21 has been amended as follows:

21. (amended) The lightweight door according to claim 20, wherein the frame reinforcement part (11d) is selected from the group consisting of a pressed part and

a deep-drawn part made from light metal or a light metal alloy, said frame reinforcement part (11d) being connected to the window frame (8) by way of welding.

Claim 23 has been amended as follows:

23. (amended) The lightweight door according to claim 19, wherein said window frame (8) has an upper angular section (20) integrated in the frame reinforcement part (11d).

Claim 24 has been amended as follows:

24. (amended) The lightweight door according to claim 1, wherein a mirror triangle (22) is formed at one of the hinge support (2) and a cross stay (1") on the top above the inner window gutter profile (5).

Claim 25 has been amended as follows:

25. (amended) The lightweight door according to claim 24, wherein said mirror triangle (11c) is a reinforcement and connection sheet (11).

Claim 26 has been amended as follows:

26. (amended) The lightweight door according to claim 1, wherein the light metal is aluminum and the light metal alloy is an aluminum alloy.

Claim 27 has been amended as follows:

27. (amended) The lightweight door according to claim 1, wherein the permanent connection has been established by welding.

Claim 28 has been amended as follows:

28. (amended) The lightweight door according to claim 9, wherein the reinforcement and connection sheets (11) are selected from the group consisting of pressed parts and deep-drawn parts.

Claim 29 has been amended as follows:

29. (amended) The lightweight door according to claim 28, wherein the reinforcement and connections sheets (11) in part form hollow chambers (12) with the supporting frame (1) at the hinge support (2).

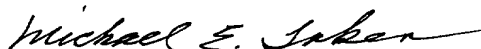
Add the following claims:

30. The lightweight door according to claim 15, wherein the lateral impact protection element (7) on a front side door is arranged so as to be horizontal from the hinge support (2) to the lock support (3), and the free L-limb of the upper hinge point strengthening plate (15) is L-shaped and directly welded together with the end of the lateral impact protection element (7).

31. The lightweight door according to claim 15, wherein on a rear side door the lateral impact protection element (7) is arranged so as to be horizontal from the hinge support (2) to the lock support (3), and wherein the lower hinge point strengthening plate (15) is L-shaped, with its free L-limb being permanently connected to the lateral impact protection element (7).

Respectfully submitted,

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Atty. Docket No. 4680-00001

VERSION WITH MARKINGS TO SHOW CHANGES MADE

Atty. Docket No. 4680-00001

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Paragraph beginning at line 19 of page 4 has been amended as follows:

Further preferred embodiments and improvements of the basic teaching of the invention are provided as set forth herein.

Before the paragraph beginning at line 23 of page 4, insert the following:

BRIEF DESCRIPTION OF THE DRAWINGS

Before the paragraph beginning at line 11 of page 5, insert the following:

DETAILED DESCRIPTION

Paragraph beginning at line 11 of page 6 has been amended as follows:

Furthermore, a profile window frame 8 made in one piece from light metal/light metal alloys, in particular from aluminium/aluminium alloys, forms part of the lightweight door according to the invention. At its ends, said profile window frame 8 is permanently connected, in particular welded, in any case to the inner window gutter profile 5. Also part of the lightweight door is an outer skin 9 of the door, said outer skin 9 being made in one piece and being permanently connected to the supporting frame 1 and the outer window gutter profile 6, in the present case in particular by flanging. Preferably, the window frame 8 is an extruded profile, bent by stretching and rolling. Its particular design is the subject of a parallel patent application, namely commonly owned co-pending U.S. Patent Application Serial No. Attorney Docket 4680-00002, filed on even date herewith, incorporated herein by reference and whose content by reference also forms part of the present disclosure.

Paragraph beginning at line 11 of page 12 has been amended as follows:

Overall, rigidity of the lightweight door is significantly increased in that the window frame 8 is rigidly connected, in a highly effective way, to the supporting frame 1. To this effect, the embodiment shown, which is the preferred embodiment, provides for the ends of the window frame 8 to extend beyond the front and rear end of the inner window gutter profile 5, where they are welded to the window gutter profile 5. As a result, the window frame 8 reaches comparatively far down into the door gutter region. This provides an adequate lever arm to effectively deflect bending moments impinging from the outside, into the door frame 1. At the lock reinforcement 11b, the embodiment shown (Fig. 6) comprises an additional frame shoulder 19 which is welded to the end of the window frame

8 which end is located in this location. Fig. 6 shows that the window frame 8 extends quite deeply into the door gutter region. The position of this section is shown in Fig. 2. In this way, the point of application of the forces is brought close to the lock position.

In the Claims:

Before the first claim insert:

What is claimed is:

Claim 1 has been amended as follows:

1. (amended) A lightweight door for motor vehicles

comprising an essentially U-shaped supporting frame (1) made from light metal or a light metal alloy, wherein said supporting frame (1) comprises: a hinge support (2) forming one U-limb, a lock support (3) forming the other U-limb and a door bottom (4) forming the U-stay, with an inner and an outer window gutter profile (5, 6) which is made from light metal or a light metal alloy, said window gutter profile (5, 6) supplementing the U-shaped supporting frame (1);

wherein if the lightweight door is installed in a motor vehicle body, the window gutter profiles (5, 6) are essentially aligned in longitudinal direction of the vehicle, with the ends of the window gutter profiles (5, 6) being permanently connected to the hinge support (2) and the lock support (3);

comprising a lateral impact protection element (7) arranged in the supporting frame (1), with the ends of said impact protection element (7) being permanently connected to the supporting frame (1), wherein the lateral impact protection element (7) is an extruded profile made from light metal or a light metal alloy;

comprising a window frame (8) made from light metal or a light metal alloy, wherein the ends of the window frame (8) are permanently connected to the inner window gutter profile (5);

wherein the supporting frame (1) is made in one piece as a pressed part or a deep-drawn part, from a metal sheet of minimum thickness.

Claim 7 has been amended as follows:

7. (amended) The lightweight door according to claim 1, wherein, in more heavily loaded areas, reinforcement and connection sheets (11) are arranged on the supporting frame (1) and permanently connected to said supporting frame (1) by a connection technique selected from the group consisting of press-riveting, bonding, and welding.

Claim 8 has been amended as follows:

8. (amended) The lightweight door according to claim 6, wherein, in the region of structural frame gussets, reinforcement and connection sheets (11) are arranged on the supporting frame (1) and permanently connected to said supporting frame (1) by a connection technique selected from the group consisting of press-riveting, bonding, and welding.

Claim 9 has been amended as follows:

9. (amended) A lightweight door for motor vehicles comprising an essentially U-shaped supporting frame (1) made from light metal or a light metal alloy,

wherein said supporting frame (1) comprises: a hinge support (2) forming one U-limb, a lock support (3) forming the other U-limb and a door bottom (4) forming the U-stay,

with an inner and an outer window gutter profile (5, 6) made from light metal or a light metal alloy, said window gutter profile (5, 6) supplementing the U-shaped supporting frame (1);

wherein if the lightweight door is installed in a motor vehicle body, the window gutter profiles (5, 6) are essentially aligned in longitudinal direction of the vehicle, and the ends of the window gutter profiles (5, 6) are permanently connected to the hinge support (2) and the lock support (3);

15 comprising a lateral impact protection element (7) arranged in the supporting frame (1), with the ends of said impact protection element (7) being permanently connected to the supporting frame (1), wherein the lateral impact protection element (7) is an extruded profile made from light metal or a light metal alloy;

20 comprising a window frame (8) made from light metal or a light metal alloy, wherein the ends of the window frame (8) are permanently connected to the inner window gutter profile (5);

wherein the supporting frame (1) is made in one piece as a pressed part or a deep-drawn part, from a metal sheet of minimum thickness;

25 wherein the supporting frame (1) contributes to form part of the inside skin (11) of the door; wherein the supporting frame (1) forms an area-shaped cross stay (1") which closes the basic U-shape and which is located opposite the door bottom (4); wherein the connection regions of the various structural members, namely the supporting frame (1), inner window gutter profile (5), lateral impact protection element (7) and window frame (8), spatially coincide so as to form structural frame gussets;

30 wherein, in more heavily loaded areas, reinforcement and connection sheets (11) are arranged on the supporting frame (1) and permanently connected to said supporting frame (1) by a connection technique selected from the group consisting of press-riveting, bonding, and welding.

Claim 10 has been amended as follows:

10. (amended) The lightweight door according to claim 7, wherein the reinforcement and connection sheets (11) are selected from the group consisting of pressed parts and deep-drawn parts.

Claim 11 has been amended as follows:

11 (amended) The lightweight door according to claim 7, wherein the reinforcement and connection sheets (11) in part form hollow chambers (12) with the supporting frame (1) at the hinge support (2).

Claim 16 has been amended as follows:

16. (amended) The lightweight door according to claim 15, wherein the lateral impact protection element (7) on a front side door is arranged so as to slope downward from the hinge support (2) to the lock support (3), and the free L-limb of the upper hinge point strengthening plate (15) is L-shaped and directly welded together with the end of the lateral impact protection element (7).

Claim 17 has been amended as follows:

17. (amended) The lightweight door according to claim 15, wherein on a rear side door the lateral impact protection element (7) is arranged so as to be upward sloping from the hinge support (2) to the lock support (3), and wherein the lower hinge point strengthening plate (15) is L-shaped, with its free L-limb being permanently connected to the lateral impact protection element (7).

Claim 21 has been amended as follows:

21. (amended) The lightweight door according to claim 20, wherein the frame reinforcement part (11d) is selected from the group consisting of a pressed part and a deep-drawn part made from light metal or a light metal alloy, said frame reinforcement part (11d) being connected to the window frame (8) by way of welding.

Claim 23 has been amended as follows:

23. (amended) The lightweight door according to claim 19, wherein said window frame (8) has an upper angular section (20) integrated in the frame reinforcement part (11d).

Claim 24 has been amended as follows:

24. (amended) The lightweight door according to claim 1, wherein a mirror triangle (22) is formed at one of the hinge support (2) and a cross stay (1") on the top above the inner window gutter profile (5).

Attorney Docket No. 4680-00001

Claim 25 has been amended as follows:

25. (amended) The lightweight door according to claim 24, wherein said mirror triangle (11c) is a reinforcement and connection sheet (11).

Claim 26 has been amended as follows:

26. (amended) The lightweight door according to claim 1, wherein the light metal is aluminium and the light metal alloy is an aluminium alloy.

Claim 27 has been amended as follows:

27. (amended) The lightweight door according to claim 1, wherein the permanent connection has been established by welding.

Claim 28 has been amended as follows:

28. (amended) The lightweight door according to claim 9, wherein the reinforcement and connection sheets (11) are selected from the group consisting of pressed parts and deep-drawn parts.

Claim 29 has been amended as follows:

29. (amended) The lightweight door according to claim 28, wherein the reinforcement and connections sheets (11) in part form hollow chambers (12) with the supporting frame (1) at the hinge support (2).